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INSECTS ASSOCIATED WITH WEEDS IN THE NORTHEASTERN UNITED STATES. II. CINQUEFOILS, *POTENTILLA NORVEGICA* AND *P. RECTA* (ROSACEAE)[1]

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Abstract.—Eighty species of insects, including 15 crop pests and 8 pollinators, are associated with *Potentilla norvegica* L. and *P. recta* L. in the northeastern United States. Among the pests are the strawberry root weevil, *Otiorhynchus ovatus* (L.), and the strawberry aphid, *Chaetosiphon fragaefolii* (Cockerell). A biological control program using insects against these weeds would be difficult due to the close genetic relationship between strawberries and cinquefoils, and probable consequent attractiveness of *Fragaria* to phytophagous insects that attack *Potentilla*.

Introduction

A survey of phytophagous insects and pollinators of the rough cinquefoil, *Potentilla norvegica* L. and the sulfur cinquefoil, *P. recta* L., was undertaken to determine the trophic niches occupied by North American insects. According to Werner and Soule (1976), there is no readily available information regarding insects affecting cinquefoils.

The genus *Potentilla* consists of about 300 primarily Holarctic species with a wide range of polyploidy (Kohli and Denford 1977), of which there are over 50 species in North America, but only about five of these are weedy.

Potentilla norvegica (2N = 70) is an annual, biennial or perennial of Holarctic origin with two subspecies: *norvegica,* being native to northern Eurasia; and *monspeliensis* (L.) Asch. and Gr., which originates in North America (Hultén 1974). *Potentilla recta* (2N = 28, 42; Darlington and Wylie 1956) is a perennial of Eurasian origin that has become established primarily in northeastern North America (Frankton and Mulligan 1970). There are three North American varieties: *sulphurea* (Lam. and DC.) Peyr., *obscura* (Nestler) Koch., and *pilosa* (W.) Led. (Werner and Soule 1976). Both species spread by dispersal of achenes.

In the northeastern and north central United States, cinquefoils are among the most important weeds in forage crops, lawns, pastures and hay (Danielson et al. 1965). Although cinquefoils may be controlled by cultivation or

[1] This is the second publication in a series on native insects associated with introduced weeds in the northeastern United States. Other genera investigated are: I, *Galinsoga* (Environ. Entomol., in press); III, *Stellaria* (J. New York Entomol. Soc., in press); *Hieracium*, *Galium*, *Galeopsis*, *Lychnis* (=*Melandrium*), *Cerastium*, *Sonchus*, and *Matricaria* (in preparation).

application of herbicides such as 2, 4-D or Silvex (the mention of a pesticide in this paper does not constitute a recommendation of this product by the USDA) (Werner and Soule 1976), control of these weeds in strawberries is difficult (Anonymous 1976). Cinquefoils are closely related to strawberries and some species have recently been hybridized with them by breeders for strawberry improvement (Scott and Lawrence 1976; Barrientos-Perez 1976). Other beneficial uses of cinquefoils are as ornamentals, including a variety of *P. recta*, "Warrensii"; for tannins (Werner and Soule 1976); as forages (Chevtaeva 1975); and as a source of anti-bacterial chemicals (Makarenko and Chaika 1974).

Materials and Methods

Phytophagous insects and pollinators of *P. norvegica* and *P. recta* were collected in Virginia, Maryland, Pennsylvania, New Jersey and New York during three years (1975–1977), at 15 locations for each species. The insects were observed, then hand-picked, aspirated or netted from plants in the field, and any feeding damage was noted. These plants were cut or uprooted, placed in large plastic bags, removed in the laboratory, and examined and beaten against a white oilcloth to loosen clinging insects. The plants were then placed in large clean plastic bags with netting caps for development or emergence of additional insects. The bagged plants were kept in the laboratory for about a month or until they decomposed and insects ceased to emerge. Most surveyed cinquefoil was collected in vacant lots or weedy pastures with a mixed plant population, but some plants were in cultivated fields.

Results and Discussion

Phytophagous insects and pollinators associated with *P. norvegica* and *P. recta* are listed in Table 1. Some additional insects associated with the introduced species *P. intermedia* L. in New York are as follows: Pseudococcidae, the lampyrid beetle *Pyropyga minuta* Le Compte, the weevils, *Anthonomus* sp. nr. *consimilis* Say and *Centorhynchus* sp., and the leafhopper *Graphocephala* sp. Unidentified tortricid, geometrid, and noctuid (Herminiinae) larvae were collected on the native *P. canadensis* L. in Maryland. Cinquefoils benefit from cross pollination to set the abundant seed necessary for their propagation, but some species, including *P. recta*, may reproduce agamospermously (Werner and Soule 1976). In a survey of insects visiting flowers of various weeds, Mulligan and Kevan (1973) found that flowers of *Potentilla* are unattractive. However, Mitchell (1960, 1962) lists 45 species of Apoidea in 21 genera as visiting cinquefoil flowers. Table 1 includes ants, bees and syrphid flies as pollinators. Cinquefoils are hosts of yellows viruses (Surgucheva 1976), that may be transmitted to crops by some of the Ho-

Table 1. Insects associated with cinquefoil. Relative frequency: C, commonly collected at most locations; M, moderate abundance, collected at 3–5 locations; R, rare, only 1 or 2 specimens, or found at less than 3 locations; —, not collected. Plant parts affected: F, flower, L, leaf, S, stem, Rt, root. Remarks: P, pollen feeder; N, nectar feeder; V, probable vector to crops of yellows virus occurring in *Potentilla*; numbers refer to months when insects were collected.

	Relative frequency			
	P. norvegica	*P. recta*	Plant part affected	Remarks
COLEOPTERA				
Bruchidae				
Bruchus brachialis F.	R	—	F	8, Pest
Cantharidae				
Chauliognathus sp.	—	M	L, S	7
Chrysomelidae				
Alticine larvae	R	—	L	8
Chrysomelid larvae	R	—	L, S	7
Longitarsus sp.	—	R	L, S	7
Sumitrosis ancoroides	—	R	L, S	7
Curculionidae				
Calomycterus setarius Roelofs	—	R	Rt	7, introduced
Gymnetron pascuorum (Gyllenhal)	—	R	L, S	7
Hypera nigrirostris (F.)	—	R	L, S	7
Oedophyrus hilleri (Faust)	C	—	L, S	7, 8, introduced
Otiorhynchus ovatus (L.)	R	—	Rt	11, Pest
Tychius picirostris (F.)	C	—	L, S	7, 9, Pest
Nitidulidae				
Brachypterolus pulicarius L.	—	R	F	6, introduced also on strawberry
Meligethes nigrescens Stephen	R	—	F	7, Pest
Scarabaeidae				
Popillia japonica Newman	C	—	L	7, Pest, introduced
DIPTERA				
Cecidomyiidae				
Mycodiplosis inimica (Fitch)	—	C	L, S, F	8, feeds on rust spores
Mycodiplosis thoracica (Fitch)	—	C	L, S, F	8, feeds on rust spores
Syrphidae				
Sphaerophoria contigua (Macquart)	—	M	F	6, N, also predaceous larvae
Sphaerophoria philanthus (Meigen)	—	R	F	6, N, also predaceous larvae
Toxomerus geminatus (Say)	—	C	F	6, 8, N, also predaceous larvae

Table 1. Continued.

	Relative frequency			
	P. norvegica	*P. recta*	Plant part affected	Remarks
Toxomerus marginatus (Say)	—	C	F	6, 7, N, also predaceous larvae
HEMIPTERA				
Berytidae				
Jalysus spinosus (Say) nymphs	—	M	L, F	6, Pest
Miridae				
Lygus lineolaris (Palisot de Beauvois)	C	C	F	7, Pest
Psallus sp.	—	R	F	8
Tingidae				
Corythucha marmorata (Uhler)	—	R	L, S	6
HOMOPTERA				
Aleyrodidae				
Aleurodicine sp.	R	—	L	9
Aphididae				
Acyrthosiphon sp.	R	C	L, S	6, 7
Aphid spp. nymphs	R	C	L, S	6
Aphis sp.	—	R	L, S	7, 8
Chaetosiphon fragaefolii (Cockerell)	C	—	L, S	7, 8, Pest
Macrosiphina sp.	—	C	L, S	6, 8
Macrosiphum euphorbiae (Thomas)	C	C	L, S	6, 7, 11, Pest
Myzus persicae (Sulzer)	M	—	L, S	11, V, Pest
Rhopalosiphum maidis (Fitch)	C	—	L, S	8, 11, Pest
Schizaphis graminum (Rondani)	R	—	L, S	11, Pest
Cercopidae				
Cercopid nymphs	M	—	L, S	6
Philaenus spumarius (L.)	—	C	L, S	6, V, Pest
Cicadellidae				
Agallia constricta Van Duzee	M	R	L, S	6
Aphrodes bicinctus (Schrank)	—	M	L, S	7
Cicadellid nymphs	M	—	L, S	7, 8
Deltocephaline nymphs	M	—	L, S	8
Graphocephala versuta (Say)	C	—	L, S	7, 8
Gyponana sp. nymphs	M	—	L, S	6
Macrosteles fascifrons (Stål)	R	—	L, S	9, V, Pest
Flatidae				
Anormenis sp. nymphs	—	R	L	7
Membracidae				
Membracid nymphs	—	M	L, S	6
Pseudococcidae				
Pseudoccocid nymphs	M	C	Rt	7, 8

Table 1. Continued.

	Relative frequency			
	P. nor-vegica	*P. recta*	Plant part affected	Remarks
HYMENOPTERA				
Apidae				
Apis mellifera L.	M	—	F	8, N
Formicidae				
Lasius neoniger Emery	—	C	F	7, N
Leptothorax sp.	—	R	F	6, N
Monomorium minimum (Buckley)	C	C	F	6, N
Halictidae				
Dialictus mitatus (Smith)	M	M	F	8, N, P
Dialictus uncinus (Sandhouse)	—	M	F	7, N
Halictus confusus Smith	R	—	F	8, N
Halictus ligatus Smith	R	R	F	6, 8, N
Tenthredinidae				
Fenusini larvae	R	—	L	7
LEPIDOPTERA				
Blastobasidae				
Blastobasid sp.	—	R	Rt	6
Geometridae				
Eupathecia sp. larvae	R	—	L, S	7, 8
Geometrid larvae	—	R	L, S	7
Lycaenidae				
Lycaena sp. larvae	R	—	L, S	7
Microlepidoptera sp.	R	—	Rt	8
Noctuidae				
Lacinipolia sp. larvae	—	R	Rt	7
Noctuid larvae	M	M	L, S	6
Plathypena scabra (Fabricius) larvae	R	—	L, S	7
Plusiine larvae	R	—	L, S	8
Pyrrhia umbria (Hufnagel) larvae	—	M	L, S	8
Pyralidae				
Pyrausta sp. larvae	R	—	L, S	11
Tortricidae				
Platynota sp. larvae	M	R	L, S	6, 8
Sparganothis sulphurana (F.) larvae, adults	M	C	L, S	6, 7
Tortricid larvae	M	—	L, S	11
ORTHOPTERA				
Gryllidae				
Oecanthus sp. nymphs	—	R	L	6
PSOCOPTERA				
Ectopsocidae				
Ectopsocopsis cryptomeriae (Enderlin)	—	R	L	7

Table 1. Continued.

	Relative frequency			
	P. norvegica	*P. recta*	Plant part affected	Remarks
THYSANOPTERA				
Idolothripinae				
Apterous	—	R	L, F	7
Winged form	—	R	L, F	6
Thripidae				
Frankliniella fusca (Hinds)	C	C	L, F	6, 7, 8, Pest
Frankliniella tritici (Fitch)	C	C	L, F	6, 7, 8, Pest
Sericothrips variabilis (Beach)	R	—	L	11
Taeniothrips atratus (Haliday)	R	—	L, F	8
Thripidae sp.	R	—	L, F	7
Thrips tabaci Lindeman	C	—	L, F	6, Pest

moptera listed in Table 1. They were also hosts of 15 crop pests, including two species that attack strawberries. These weeds were not severely damaged by the insects listed here. Cinquefoils were frequently attacked and damaged by rust fungi, which were eaten by cecidomyiid larvae.

Due to the close genetic and physiological similarity between cinquefoils and strawberries, it may be difficult to locate specific biological control agents that will not also attack *Fragaria*. The initiation of a biological control program for these weeds is therefore not highly recommended.

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